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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/072,959	05/05/1998	PAI HUNG PAN	2919.1US	7136

7590 12/28/2004  
JOSEPH A WALKOWSKI  
TRASK BRITT & ROSSA  
P O BOX 2550  
SALT LAKE CITY, UT 84110

EXAMINER


FOURSON III, GEORGE R

ART UNIT	PAPER NUMBER
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2823

DATE MAILED: 12/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>		<b>Applicant(s)</b>	
	09/072,959		PAN, PAI HUNG	
	<b>Examiner</b>		<b>Art Unit</b>	
	George Fourson		2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 12 October 2004.
- 2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-5, 11-17, 25-28 and 33-38 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5, 11-17, 25-28 and 33-38 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)             | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

A request for continued examination under 37 CFR 1.114 was filed in this application after appeal to the Board of Patent Appeals and Interferences, but prior to a decision on the appeal. Since this application is eligible for continued examination under 37 CFR 1.114 and the fee set forth in 37 CFR 1.17(e) has been timely paid, the appeal has been withdrawn pursuant to 37 CFR 1.114 and prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on 10/12/04 has been entered.

Claims 1-4, 11-14, 16, 25-27, 33-35 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai et al in view of Lancaster.

Tsai et al discloses in figures 3a-3h and the accompanying description formation of dielectric layer 32 and buffer layer 34 over semiconductor substrate 30, patterning of layers 32 and 34, trench etching using the patterned layers 32 and 34 as a trench mask, thermal oxidation of the trench walls, selective isotropic etching of layer 34 and filling of the trench with silicon dioxide isolation material. Further, the references teaches as an alternative to the depicted process removal of layer 36A prior to deposition of the trench fill oxide (col.3, lines 33-34). In that embodiment the trench fill oxide would contact both the top major surface of the buffer layer 34 and the side surface of buffer layer 34. The reference discloses the purpose of the thermal oxidation of the trench walls to be "for relieving the defect resulting from the aforementioned etching process" which is removal of the nitride layer 34 (col.3, lines 33-37). The reference does not disclose forming the oxide layer before the etching of layer 34.

Lancaster discloses that in removal of a nitride trench etch mask with phosphoric acid, which is the etchant used in the removal of the nitride layer in the process of Tsai et al (col.3, line 22), the silicon of the

trench may be attacked by the etchant and it is helpful to form sacrificial oxide 52a on the trench surfaces prior to nitride removal (col.3, lines 40-49).

It would have been within the scope of one of ordinary skill in the art to combine the teachings of Lancaster with those of Tsai et al to protect the trench surfaces during removal of the nitride layer 34 in the process of Tsai et al to further provide trench wall surfaces that are free from damage. The sacrificial oxidation step of Tsai et al would provide the additive effect of further providing trench wall surfaces that are free of damage as is the aim of Tsai et al.

Claims 17 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai et al in view of Lancaster as applied to claims 1-4, 11-14, 16, 25-27, 33-35 and 37 above, and further in view of the following comment.

Tsai et al discloses removal of 50-100 angstroms of buffer layer 34. In view of this disclosure, one of ordinary skill in the art would have been led to the recited amount of buffer layer 34 to be removed to achieve formation of desired device dimensions and resulting device characteristics on the finished wafer. Further, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to choose these particular dimensions because applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner*

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v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). See also MPEP 2144.04(IV)(B).

Claims 5,15,28 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai et al in view of Lancaster as applied to claims 1-4,11-14,16,25-27,33-35 and 37 above, and further in view of Lee et al.

Tsai et al does not disclose densification of the trench fill material. Lee et al discloses densification of trench fill material (abstract, for example). It would have been within the scope of one of ordinary skill in the art to combine the teachings of the Tsai et al and Lee et al to enable the trench fill material of Tsai et al to be densified according to the teachings of Lee et al that the method is intended for trench fill dielectrics and to obtain the benefit disclosed by Lee et al of reduced oxide consumption in subsequent process steps (p.158, col.1, lines 23-25).

Applicants arguments are moot in view of the new grounds of rejection above.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to George Fourson whose telephone number is (571) 272-1860. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri, can be reached on (571) 272-1855. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should

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you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



George Fourson  
Primary Examiner  
Art Unit 2823

GFourson  
December 22, 2004